



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,970	07/11/2005	Alix Helene Gicquel	05-583	8766
20306	7590	08/10/2006		
MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP				
300 S. WACKER DRIVE				
32ND FLOOR				
CHICAGO, IL 60606				
			EXAMINER	
			STOUFFER, KELLY M	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 08/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/541,970

Applicant(s)

GICQUEL ET AL.

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☒ Claim(s) 4-8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 27 March 2006.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

1. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

The declaration is in French. Please translate declaration to English.

Specification

2. The abstract of the disclosure does not commence on a separate sheet in accordance with 37 CFR 1.52(b)(4). A new abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text.
3. The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT
- (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings"

Art Unit: 1762

(37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or
REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a). "Microfiche Appendices" were accepted by the Office until March 1, 2001.)

(f) BACKGROUND OF THE INVENTION.

(1) Field of the Invention.

(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.

(g) BRIEF SUMMARY OF THE INVENTION.

(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).

(i) DETAILED DESCRIPTION OF THE INVENTION.

(j) CLAIM OR CLAIMS (commencing on a separate sheet).

(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).

(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Please include headings to designate each section in the specification.

4. The disclosure is objected to because of the following informalities:

Numerous run-on sentences. For example on page 4 lines 31-38: "Also in the vacuum chamber is a single injection nozzle 4, or a plurality of injection nozzles, for emitting into the vacuum chamber, gases comprising, on the one hand, a source of molecular hydrogen, such as dihydrogen H₂, and, on the other hand, a source of carbon, such as for example a hydrocarbon like methane CH₄, carbon dioxide CO₂ or the like."

Omission of articles. For example on page 4 line 30: "acting as cavity" should be --acting as a cavity--.

Appropriate correction is required.

Claim Objections

5. Claims 4-8 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim shall not serve as a basis for any other multiple dependant claim. Claims 4-8 are multiple dependant claims that depend upon claim 3, which is also a multiple dependant claim. See MPEP § 608.01(n). Accordingly, the claims 4-8 have not been further treated on the merits.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent number 5240749 to Chow.

Chow discloses a method for synthesizing diamond films that includes pulsed microwave plasma described in column 2 lines 56-68 in a vacuum chamber 10 in figure 2. Plasma 75 in Figures 3-5 of a finite volume as described in column 2 lines 5-57 is formed near a substrate 15 in Figures 2-5. The plasma 75 is formed from hydrogen and methane gases as described in column 2 line 51. The applicant claims the plasma is formed from gas subjected to a pulsed discharge with low and high power states having a peak absorbed power to obtain at least carbon-containing radicals in the plasma. Chow discloses the gas

Art Unit: 1762

forms plasma from being subjected to low and high power densities from the microwave discharge to form plasma as described in column 2 lines 55-68. The peak absorbed power that generates carbon radicals is broadly included in the disclosure of Chow because the plasma by definition (see Blinov et al. column 3 lines 53-62 cited herewith) contains radicals and must have reached a peak power to form said radicals. The plasma 75 containing radicals forms a diamond film 85 in Figures 4 and 5 thereon. The applicant claims that the plasma must have a peak power density of greater than 100 W/cm^3 while maintaining a substrate temperature of between $700\text{-}1000^\circ\text{C}$. Chow discloses a substrate temperature within the range of $680\text{-}750^\circ\text{C}$ described in column 4 lines 13-14 and power densities of 600 and 1000 W/cm^3 described in column 5 line 50 and line 63, respectively. Chow meets the recitations in claim 1, at least as broadly recited in claim 1, for a method for manufacturing a diamond film.

With regard to claim 3, Chow discloses the gas used to create the plasma as 1.5 % methane in a hydrogen gas environment in column 4, lines 1-4. This meets the recitation in claim 3 that the gas containing hydrogen and carbon must have a molar ratio of between 1-12 % at least as broadly recited in the claim.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which

Art Unit: 1762

said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chow in view of Kwarada et al. Chow is discussed in paragraph 6 above and includes a method for manufacturing a diamond film using plasma that includes power densities of the film in the range of 600-1000 W/cm³. Chow does not disclose the range of power density to be from 100 to 250 W/cm³ or the plasma temperature. Claim 2 of the applicant requires that the power density of the plasma should be from 100 to 250 W/cm³ and the maximum temperature of the plasma should be between 3500-5000 K in order to deposit diamond on a substrate. The parameter of power density of the plasma is a result-effective variable as stated by Chow column 5 lines 65-69 and column 6 lines 1-9. Said power densities depend upon the particular apparatus and conditions employed in carrying out the method and the importance of these ranges is that they are sufficient to deposit plasma on the substrate and diamond film. Optimization of this parameter is by routine experimentation and is not inventive. (See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955))

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Chow to include the plasma power density in the range of 100 to 250 W/cm³ through routine experimentation in order to optimize the power density for particular apparatuses and conditions employed in depositing a diamond film by plasma especially absent evidence showing a criticality for using the claimed power densities.

Chow is silent as to the plasma temperature and H atom concentration and therefore does not explicitly disclose a maximum temperature of the plasma being between 3500 K and 5000 K, the temperature of the plasma less than 1 cm from the substrate being between 1500 K and 3000 K, or the plasma containing hydrogen atoms at the claimed concentrations.

However, Kawarada et al. teaches that the plasma temperature is in the range of 1000-3000 °C and the plasma density of the plasma is within the range of 10³-10¹⁶ cm⁻³ in order to deposit a carbonaceous substance such as diamond at a high rate. Therefore, it would have been obvious to have maintained the plasma temperature within a range of 1000-3000 °C, which is both below the claimed maximum temperature and within the range desired within a cm of the substrate, because doing so would be expected to provide the diamond film on the substrate at a high rate.

Chow and Kawarada et al. are silent as to the H atom concentration in the plasma; however, this parameter clearly affects the reaction with methane as these components react to form the diamond film. As such, the H atom concentration in the plasma is a result effective variable and it would have been

Art Unit: 1762

obvious to adjust this parameter through routine experimentation to values in the claimed range as to optimize the reaction to form diamond, especially absent evidence showing a criticality for using the claimed concentrations.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Ito et al. shows a method for producing diamond films that includes an oscillating microwave plasma

Blinov et al. shows a method for producing diamond films that includes microwave plasmas with similar power densities and substrate temperatures

Sevillano et al. shows a method for producing diamond films that includes microwave plasmas with similar power densities and substrate temperatures

Miyanaga et al. shows a method for producing diamond films that includes a pulsed microwave plasma

Tsuno et al. shows a method for producing diamond films from carbon plasma

Knowles et al. shows a method for producing diamond films from plasma

Kawarada et al. shows a method for producing diamond films from plasma

Art Unit: 1762

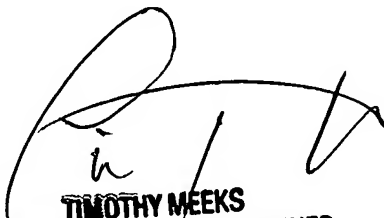
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Friday 7:00-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kelly Stouffer
Examiner
Art Unit 1762

kms



TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER